

World's Columbian Exposition, Chicago, 1893.

CATALOGUE

OF

NEW SOUTH WALES EXHIBITS.

DEPARTMENT G.

TRANSPORTATION—RAILWAYS,
VESSELS, VEHICLES.



Sydney :

CHARLES POTTER, GOVERNMENT PRINTER, PHILLIP-STREET.

DEPARTMENT G.

TRANSPORTATION—RAILWAYS, VESSELS,
VEHICLES.

Department G.—Transportation—Railways, Vessels, Vehicles.

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(IN CHARGE OF TRANSPORTATION).

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Department G.—Transportation—Railways, Vessels, Vehicles.

CLASSIFICATION.

CLASSIFICATION.

Group 80.—Railways, Railway Plant, and Equipment.

Class 499.—Railway Construction and Maintenance—Maps, profiles, etc. Grading, track-laying and ballasting machinery. Samples of Standard Permanent Way. Systems of drainage. Ballast, culverts, ties, methods of preserving ties. Rails, rail fastenings, frogs, crossings, switches, &c. Cattle guards. Railway bridges, trestles, viaducts, with models and drawings. Tunnelling, with machinery, models, maps. Methods of constructing, lighting, and ventilating tunnels. Turn-tables and transfer-tables. Water supply and machinery and fixtures used by railroads in connection therewith. Track tools. Systems of maintenance. Snow-sheds and other protection against snow. General plans, elevations and models of stations and other railroad structures.

Class 500.—Railway Equipment—Locomotives for passenger and freight service. Locomotive appliances—head lights, bells, whistles, brake valves and apparatus, &c. Plans, drawings and photographs of locomotives and locomotive shops.

Passenger cars.—Mail, baggage, and express coaches, drawing-room, parlour, dining, officers', and private cars, &c. Passenger car furnishings and appliances.

Freight cars—Box, caboose, stock, horse, milk, refrigerator, and other varieties. Working cars—sweeping, ditching, wrecking, &c.; snow ploughs, hand, inspection, push and velocipede cars, baggage barrows and trucks. Freight car appliances of all descriptions. Plans, drawings, and photographs of cars and car works.

Class 501.—Railway Operation—Purchasing department. Methods of purchasing, storing, and distributing material and disposition of condemned material. Railway stationery.

Mechanical Department.—Organisation. Records, plans, and management of shops. Devices for coaling locomotives, &c. Testing laboratories. Machines, apparatus, and methods of testing.

General train management—Dispatching, signaling, &c. Speed indicators and recorders. Interlocking switches and signals. Block systems, &c. Crossing protection by gates, signals, &c. Wrecking tools and appliances. Plans of yards and methods of storing, cleaning and keeping cars. Car interchange and inspection. Systems of accounting, records, tracers.

Railway employees—Methods of testing for colour-blindness, &c. Uniforms, organisations, &c. Railway sanitation and surgery and appliances used therein.

Department G.—Transportation—Railways, Vessels, Vehicles.**CLASSIFICATION.**

Class 502. Railway Management—Legal department, treasury and accounting departments, passenger department. Advertising. Tickets, ticket cases, punches, baggage checks, &c. Freight department, methods of rate-making, soliciting, handling, billing, &c.; plans, arrangements, and appliances for handling and housing of freight. Freight-handling machinery, track scales, apparatus for transferring grain from car to car. Traffic associations, their objects, methods, &c.

Class 503.—History and statistics, exemplified by exhibits of old locomotives, cars, track material and other relics. Railway law and legislation. Railway technical engineering and mechanical associations. Railway literature.

Group 81.—Street Car and other Short Line Systems.

Class 504.—Cable roads and cars. Construction, equipment, methods of operation. Grips and other appliances.

Class 505.—Electric railway cars. Systems of track construction, equipment, and supplies for electric roads, methods of operation, appliances and furnishings.

Class 506.—Cars for street railways or tramways operated by horse-power or other means of propulsion not specified. Construction. Equipment and supplies. Methods of operation.

Class 507.—Elevated and underground railways. Plans, models, and maps, showing systems of construction. Systems of operation and maintenance.

Group 82.—Miscellaneous and Special Railways.

Class 508.—Mountain railways, spirals, switchbacks, rack rails, and all systems for climbing inclines, ship railways, multiple speed railways (moving platforms and sidewalks), gravity roads, sliding railways, plans, profiles, drawings, photographs, and models.

Group 83.—Vehicles and Methods of Transportation on Common Roads.

Class 509.—Hand-barrows, wheel-barrows, trunk and barrel-trucks.

Class 510.—Carts, trucks, drays, farm waggons, garden truck waggons.

Class 511.—Freight waggons and other heavy waggons for special purposes, beer waggons, express waggons, waggons for moving heavy objects, as timbers, stone, iron, &c. Sprinkling carts (for fire engines and ladder trucks see Group 70).

Class 512.—Large waggons for pleasure parties, picnic parties, and excursions, "breaks," "barges," "waggonettes," &c.

Class 513.—Omnibuses, herdies, cabs, hansom, &c.

Class 514.—Drags, Concord leather spring coaches; mud waggons for mail, express, and passenger service.

Class 515.—Pleasure carriages, coaches, Victorias, Broughams, dog carts, &c.

Class 516.—Light pleasure carriages, buggies, phaetons, &c.; trotting waggons and sulkies.

Class 517.—Sleighs, sleds, cutters, toboggans, snow shoes, &c.

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Class 518.—Steam and electric carriages, and all vehicles for carrying passengers on common roads operated by other than horse-power.

Class 519.—Ambulances for special purposes—for the sick and injured. Hearses.

Class 520.—Bicycles, tricycles, and the appurtenances.

Class 521.—Rolling chairs for invalids and others, baby carriages, &c.

Class 522.—Wagon and carriage woodwork, hardware, and fittings.

Class 523.—Harness, saddlery, robes, whips and accessories, of the stable.

Group 84.—Aerial, Pneumatic, and other Forms of Transportation.

Class 524.—Transportation of letters and parcels in pneumatic tubes.

Class 525.—Shop-fittings for the transportation of parcels and money.

Class 526.—Balloon transportation and captive balloons for observation and experiment.

Class 527.—Passenger elevators and lifts.

Group 85.—Vessels, Boats—Marine, Lake and River Transportation.

Class 528.—Sailing vessels and boats. Sailing vessels used in commerce, pilot boats, fishing vessels, sailing yachts, ice boats, ships' boats, pleasure boats, canoes, and small boats of all kinds propelled by sails, oars or paddles. Models, designs, drawings, descriptions, specifications, photographs, paintings, &c.

Class 529.—Steamships and all vessels propelled by steam, electricity, or motive power other than sails, oars, or paddles. Ocean steamships, coasting, lake, and river steamers. Tank steamers, cable steamers, steam pilot vessels, steam fishing vessels, steam fire, police, and patrol boats, steam schooners, tow-boats, steam yachts, steam launches, naphtha launches; vessels designed for jet propulsion or to be propelled by any unusual device. Models, designs, &c.

Class 530.—Vessels, boats, and floating structures for special purposes. Docks and other receptacles for vessels and structures used for docking or hauling out vessels or boats. Transports for carrying railway trains or cars, barges, canal boats; coal rafts and coal boxes; water boats, dredges, floating derricks, elevators, &c. Dry docks and marine railways. Models, designs, drawings, &c.

Class 531.—Marine mechanical appliances. (For nautical instruments, see Group 151.) (For marine engines, boilers, pumps, condensers, and appurtenances, see Group 69.) Devices for propulsion, devices for obtaining forced draft, steam capstans, windlasses, deck winches, appliances to facilitate loading and discharging cargoes, steering apparatus; marine electric motors, electric indicators, engine-room and bridge signal systems and apparatus; boat-lowering and detaching apparatus, speed indicators and speed registers, appliances for laying, picking up, and repairing ocean telegraph cables, &c.

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- Class 532.—Construction, outfit, equipment, and repair of vessels.—Methods, articles, fittings, or appurtenances. Methods and materials used; special designs for hull or fittings; plates, cellulose, woodite, &c.; water-tight compartments, rudders, masts and spars, rigging; anchors, chains, and cables; hawsers, ropes, cordage, wire rope, &c.; sails, blocks and tackles, oars, &c.
- Class 533.—Methods of lighting, heating, ventilation, and refrigeration of ships.
- Class 534.—Protection of life and property, and communication at sea. Harbours; light-houses; buoys and similar aids to navigation, and all pertaining thereto; life-saving service, boats, rafts, belts, &c.; precautions against fire aboard ship, and devices for extinguishing it; stern and coast signals; marine signals. Models, plans, samples, &c.
- Class 535.—Wrecking apparatus. Submarine armour and divers' appliances, pontoons for raising vessels, equipment for wrecking steamers, &c.
- Class 536.—Miscellaneous. Trophies of yacht and boat clubs, relics of merchant marine and river transportation, relics of arctic and other exploration, seamen's associations, uniforms and designations of rank, flags and ensigns of merchant marine, yacht clubs, &c., designs, maps, charts, boats.

Group 86.—Naval Warfare and Coast Defence.

- Class 537.—Armoured vessels. Battle-ships, rams, cruisers, coast defence ships. Models, designs, drawings, descriptions, specifications, photographs, paintings, &c.
- Class 538.—Unarmoured vessels. Frigates, sloops, and gun vessels, cruisers, despatch vessels and tenders, torpedo vessels and torpedo boats, sub-marine boats, public vessels for special service, revenue vessels, surveying vessels, &c. Man-of-war boats, &c. Models, designs, &c.
- Class 539.—Ships and boats of war of barbarous and semi-civilized nations. Models, drawings, photographs, &c.
- Class 540.—Models and relics of famous ships of war, relics of naval battles, &c.
- Class 541.—Training ships; naval schools; naval institutes, naval reserve, &c.
- Class 542.—Guns and armour, and adjuncts and appliances of naval warfare (see also Group 113). Guns, armour, torpedoes, small arms for naval use, projectiles and ammunition, fuses, sub-marine mines, methods, devices, fittings or appliances designed for use in naval warfare and coast defence.

Department G.—Transportation—Railways, Vessels, Vehicles.

Group LXXX—Class 499: Railway Construction and Maintenance, &c.

GROUP LXXX.—Railways, Railway Plant and Equipment.

CLASS 499.—Railway Construction and Maintenance: Maps, Profiles, &c.; Grading, Track-laying, and Ballasting Machinery; Samples of Standard Permanent-way; Systems of Drainage; Ballast, Culverts, Ties, Methods of Preserving Ties; Rails, Rail-fastenings, Frogs, Crossings, Switches, &c.; Cattle Guards; Railway Bridges, Trestles, Viaducts, with Models and Drawings; Tunnelling with Machinery, Models, Maps; Methods of Constructing, Lighting, and Ventilating Tunnels; Turn-tables and Transfer-tables; Water Supply, and Machinery and Fixtures used by Railroads in connection therewith; Track Tools; Systems of Maintenance; Snow Sheds and other protection against Snow; General Plans, Elevations and Models of Stations and other Railroad Structures.

1068. COMMISSIONERS FOR NEW SOUTH WALES RAILWAYS, Sydney.

Two maps showing the railway systems of New South Wales.

These maps of the Colony of New South Wales show the existing lines with a bordering of red, while those under construction are edged with blue. Open for traffic 1892, 2,313 miles, with 205 miles under construction.

Longest distance by rail from Sydney northwards	490 miles
Do do do west	503 ,,
Do do do south	387 ,,
Do do do south-west	454 ,,

Longest through journey—

Jennings (Queensland Railways) to }
Albury (Victorian Railways).. } 870 miles.

Longest through journey—

Jennings to Bourke, most westerly railway }
town in New South Wales..... } 986 miles.

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Group LXXX—Class 499 : Railway Construction and Maintenance, &c.

1069. COMMISSIONERS FOR NEW SOUTH WALES RAILWAYS, Sydney.

Sample of the permanent-way of the Colony, in the shape of two pairs of 30 ft. rails with their accompaniments.

A.—A complete section of the permanent-way of the Colony showing one length of rail. The flat-bottomed steel rail, 80 lb. to the yard, is used on the main line. Spikes secure the rail to the ties, which are of a superior hardwood called "ironbark" (*Eucalyptus siderophloia* and *E. Crebra* F.v.M.) which weighs 80 lb. per cubic foot. These ties are very durable, the old ties forming part of the Commissioners' exhibit having been down for twenty-three and twenty-four years respectively.

B.—The companion section of the permanent-way is that used on the suburban line. It consists of 80 lb. bull-headed rails with 45 lb. chairs of special construction, being wide at their base to prevent undue cutting of the ties, and with a serrated edge to prevent the keys from slipping; these keys are of "teak," and answer very well in a climate that is very trying to timber generally. The before mentioned "ironbark" sleepers are used. This timber is almost exclusively used for railway ties, 9 feet lengths being generally used—ties 9 feet by 10 inches by 5 inches, weighing on an average 252 lb. Its great weight and durability render it a most valuable adjunct to the permanent-way of the Colony. It is obtained locally in abundance. Spacing of ties is, as a rule, 2 feet 7 inches. The weight of one mile of this permanent-way is 371 tons 1 cwt. 3 qrs. (831 230 lb.) All weights mentioned are English tons.

1070. COMMISSIONERS FOR NEW SOUTH WALES RAILWAYS, Sydney.

Series of Miscellaneous Photographs.

No. 20. Bridge over the Hawkesbury River.

This photograph shows the bridge spanning the Hawkesbury River, 36 miles to the north of Sydney, connecting that city with the northern portion of the railway system, and allowing of through communication with the Queensland Colony. It has a length of 2,896 feet from face to face of the abutments, and consists of seven spans on six pairs of cylinders, those on the Sydney side having a length of 146 ft. 6 in., and those on the other side a length of 210 ft. 6 in. This important bridge was opened for traffic on 1st May, 1889.

No. 22. George's River and Bridge to Como.

On the Illawarra Line, 12 miles from Sydney to the South, just before entering the village of Como, and within a few miles of the National Park—a magnificent tract of land, 58 miles in extent (36,900 acres), and a proper resort for picnic parties, much patronised by Sydney residents, and a source of considerable revenue to the railways.

No. 23. Albury Station.

Albury Station is the most southerly point of the New South Wales railways, where they connect with those of the adjoining Colony, Victoria. Here passengers from Sydney to Melbourne or Adelaide have to change from the New South Wales train on a gauge of 4 ft. 8½ in. to a Victorian train on a track with a gauge of 5 ft. 3 in. The inconvenience to the travelling public is very great, and the loss to the railways considerable, owing to the goods traffic being all transhipped at this point.

No. 24. Arrangements for Shipping Coal at Newcastle.

The arrangements for shipping coal at the port of Newcastle are well shown in this photograph. The cranes, which are worked by hydraulic power, are fifteen in number, and 2,105,770 tons of coal were shipped for the year ending 30th June, 1892. The coal-hopper seen under the crane is lifted out of its frame, and the wheels, &c., are left standing on the

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Group LXXX—Class 499: Railway Construction and Maintenance, &c.

track, and when the hopper, lifted by the crane, is slewed round to its proper position over the hatchway, a catch is released, the bottom of the hopper opens on a hinge, and the coal is dropped into the hold of the ship. 313,246 tons of coal were shipped from Newcastle to San Francisco in the year ending 30th June, 1892.

No. 25. Goods Shed at Sydney.

The Sydney Goods Shed, which is the central depôt for goods, has a length of 1,060 feet, and is capable of holding 126 trucks. It is very centrally situated, and has a water frontage to the harbour.

1071. COMMISSIONERS FOR NEW SOUTH WALES, Sydney.

Series of Photographs, illustrating the Railway Stations and Bridges, &c., of the Colony, prepared by the Government Printer (Charles Potter).

No. 1. Railway Institute, Sydney.

2. Railway Construction in New South Wales.
3. Lithgow Valley, Zig Zag.
4. Hawkesbury Railway Bridge.
5. Railway Bridge, over the Parramatta River, at Ryde.
6. Railway Line over Brisbane Water.
7. Moss Vale Railway Bridge.
8. Railway Bridge, over the Murray River, at Albury.
9. Aberdeen Railway Bridge.
10. Railway Station, Albury.
11. Do do
12. Do do
13. Do Tenterfield.
14. Do do
15. Junee Railway Junction.
16. Do do
17. Do do
18. Werris Creek, Railway Junction.
19. Do do
20. Railway Station, Newcastle.
21. Do do
22. Railway Running Sheds at Eveleigh.
23. Do Workshops do

1072. KINGSBURY & CO., H. H., Electrical Engineers, 54 Margaret-street, Sydney.

A Ratchet Lock-nut Washer, for fastening nuts on bolts, for Railway purposes.

Department G.—Transportation—Railways, Vessels, Vehicles.

Group LXXX—Class 500: Railway Equipment, Passenger and Freight Cars, &c.

CLASS 500.—Railway Equipment: Locomotives for Passenger and Freight Service.—Locomotive Appliances: Head Lights, Bells, Whistles, Brake-valves and Apparatus, &c.; Plans, Drawings, and Photographs of Locomotives and Locomotive Shops.

Passenger Cars: Mail, Baggage, and Express Coaches, Drawing-room, Parlour, Dining, Officers' and Private Cars, &c.; Passenger Car Furnishings and Appliances.

Freight Cars: Box, Caboose, Stock, Horse, Milk, Refrigerator, and other varieties.—Working Cars: Sweeping, Ditching, Wrecking, Snow Ploughs, Hand, Inspection, Push, and Velocipede Cars; Baggage, Barrows, and Trucks.—Freight Car Appliances of all descriptions; Plans, Drawings, and Photographs of Cars and Car Works.

1073. COMMISSIONERS FOR NEW SOUTH WALES RAILWAYS, Sydney.

Series of Photographs of Rolling Stock, Locomotives, Passenger Stock, and Goods Stock.

No. 1. English Express Engine.

This photograph portrays a specially designed powerful express engine, produced under the directions of the Railway Commissioners by their Chief Mechanical Engineer, Mr. Thow, in conjunction with the builders of the engine (Messrs. Beyer, Peacock, & Co., of Manchester). The engine has the following principal dimensions:—Cylinders, 20 in. x 26 in.; driving wheels, 5 ft.; weight in steam on six coupled wheels, 41 tons (English) 17 cwt. 1 qr. (93,770 lb.); boiler pressure, 160 lb.; total heating surface, 1,916 square feet; grate area, 27 square feet; capacity of tank, 3,090 English gallons; total weight in steam, engine 56 tons (English) 10 cwt. 3 qrs. (126,644 lb.); tender 31 tons (English) 16 cwt. 1 qr. (71,260 lb.); total length over buffers, 55 ft. 9½ in. These engines are for the purpose of carrying the mail and express trains over the long and severe grades met with on all the lines owned by the Government of New South Wales, the total number of miles open at present being 2,313, and of this amount 620 miles are on grades varying from 1 in 30 (176 feet to the mile) to 1 in 75 (70 feet to the mile). The engines have now been worked for some time, and have given the greatest satisfaction, lifting loads of 253 tons (English), inclusive of engine and tender, up grades of 1 in 30 at eighteen to twenty miles per hour.

No. 2. English Goods Engine.

A representation of a six-wheel coupled English Goods Engine. It has 18 in. by 26 in. cylinders, driving wheels 4 ft. 0½ in.; total weight on driving wheels in steam, 37 tons (English) 14 cwt. (84,440 lb.); boiler pressure, 150 lbs.; total heating surface 1,350 square feet; grate area, 21 square feet; total weight in working order, engine 46 tons 10 cwt. (104,160 lb.), tender 30 tons (English) or 67,200 lb. A few more powerful engines are in use for special purposes, but this engine is the standard for goods traffic, ninety-five now being at work on these railways.

No. 3. Saddle Tank Engine.

The Saddle Tank Engine, of which a good idea is given by this photograph, has cylinders 18 in. by 26 in.; driving wheels, 4 ft. 0½ in.; weight in steam on its six coupled driving wheels, 41 tons (English) 3¾ cwt., or a total weight of 65 tons (English) 18 cwt. 1 qr. (147,648 lb.); boiler pressure, 160 lb.; heating surface, 1,438 square feet; grate area, 21 square feet. This engine is used for goods and mineral traffic and for shunting purposes.

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Group LXXX—Class 500: Railway Equipment, Passenger and Freight Cars, &c.

No. 4. Passenger Tank Engine.

The Tank Engine is used for the suburban traffic in and out of Sydney (population 387,000 in 1891). The engine hauls seven cars, American type, capable of seating 420 passengers.

No. 5. Pullman Vestibule Car.

No. 5 represents the Pullman Vestibule Car used on the intercolonial express trains leaving Sydney for Albury (387 miles) *en route* to Melbourne, a change being necessary at this point owing to the break of gauge, the New South Wales lines being laid to the standard gauge (4 ft. 8½ in.), and the Victorian lines being of the wider (5 ft. 3in.) gauge. Melbourne is 190 miles from Albury. These cars are 66 ft. over end platforms, are 9 ft. 7½ in. in width over the eaves, with an extreme height of 13 ft. 5¾ in. outside. They were specially manufactured for these railways, brought to Australia in sections, and there fitted up. They have accommodation for twenty-eight sleepers, and are provided with smoke-room and lavatory. These cars will be seen in position on

No. 6. Intercolonial Train leaving Sydney for the South.

The first-class carriage (No. 7) is also attached to this train, and a second-class carriage of the same type is also added. These, with the mail-van and brake-van with second-class accommodation, go to make up one of the finest trains—if not the finest—in Australia. The approximate weight of the train is 207 tons, its total accommodation 236 passengers, and its total length 382 feet, both exclusive of engine and tender.

No. 7. First-class Lavatory Carriage.

A separate view of the First-class Lavatory carriage will be seen in this photograph. The carriage has accommodation for forty passengers, in four full and two half compartments. The lavatories are placed between the ladies' and gentlemen's compartments, and open on to either from alternate sides, each lavatory occupying one-half the width of the carriage. Two other compartments with lavatories are provided for general use. The half-compartments (coupe) at the end have no lavatories, and seat four passengers only. The total length over panels is 46 ft., and the tare is 48,160 lb., or 21½ tons (English).

No. 8. Brake-van, with second-class accommodation.

The Brake-van, with second-class and lavatory accommodation, is shown in No. 8. This is of the same type as the lavatory carriage. Its tare is 43,000 lb., or 19 tons 4 cwt. (English), and its length over panels 46 feet. Ten passengers can be carried, and there is a lavatory for ladies and one for gentlemen. The mail or luggage portion occupies three-fourths of the length of the van.

No. 9. Composite Sleeper, with Lavatory, for branch lines.

Showing another form of Lavatory Carriage. This is used on long journeys from Sydney to branch lines, and consists of the usual lavatory type exterior and interior in the day time, but two of the compartments can be changed to sleeping berths at night, and by these means through passengers to branch lines can obtain uninterrupted sleep from the commencement of their journey to the end, instead of changing at the junctions, as in former times, and often, too, in the middle of the night. This carriage will seat twenty-four first-class and twenty second-class passengers in the day time; or, used as a composite sleeping car, it affords sleeping accommodation for six sleepers, seating room for eight first-class and twenty second-class passengers. Its tare is 46,400 lb., or 20 tons 14 cwt. (English).

No. 10. Suburban Through Communication Train.

A type of carriage largely used in New South Wales is the Suburban Through Communication Train, as shown in No. 10. This train consists of six cars of the open-ended character, with seats on either side of a central aisle, and with platform at either end. They have seating room for 60 passengers per car, or 360 to each train, and are largely used for suburban traffic. Length over platforms 49 ft. 6 in., tare 41,440 lb., or 18½ English tons.

The Merchandise Goods Rolling Stock is represented by—

Nos. 11 and 12. Tubular Open Goods Wagons,

Which are 33 ft. 9 in. inside, with a capacity of 49,280 lb. (22 tons) and a tare of 22,400 lb. (10 tons). The Closed Tubular Goods Wagon has a capacity of 42,500 lb. (19 tons) and a tare of 25,980 lb. (11 tons 12 cwt.). The Bolster Tubular Wagon, which is used for carrying rails, timber, &c., will carry 49,280 lb. (22 tons) and has a tare of 22,400 lb. (10 tons).

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Group LXXX—Class 500 : Railway Equipment. Class 503 : Railway Statistics.

No. 13. Open Goods Wagon, with bogie and iron underframe,
Has a capacity of 51,520 lb. (23 tons) and a tare of 25,424 lb. (11 tons 7 cwt.) ; while

No. 14. Four-wheel Goods Wagon

gives the most usual form of Goods Wagon in New South Wales, with a capacity of 22,400 lb. (10 tons) and a tare of 13,160 lb. or 5 tons 17½ cwt.

No. 15. Refrigerator Car.

The Refrigerator Car, shown in this photograph, has a capacity of 26,880 lb. (12 tons) and a tare of 34,720 lb. (15½ tons), and is used for bringing carcases of beef and mutton from the Meat Chilling and Freezing Works in the country to the Metropolitan port of shipment*. Ice is used when the meat is being conveyed long distances ; but for frozen meat at works within 100 miles of market or port of shipment the meat is chilled in the Companies' Works, placed in ears, which are practically air-tight, and conveyed without ice being carried in the cars.

No. 16. Louvred Van.

The Louvred Van is 15 ft. over ends, has a capacity of 17,920 lb. (8 tons) and a tare of 14,560 lb. (6½ tons). These vans are extensively used for fruit, butter, milk, and similar perishable articles in the warm weather.

No. 17. Iron Hopper Coal Wagon.

This Iron Hopper Coal Wagon, used for the coal trade, will be seen in working order on photo. No. 24. (Class No. 499.)

No. 18. Cattle Vans—two kinds.

No. 19. Sheep Vans—two kinds.

The live stock vehicles are represented by No. 18, Cattle Vans of two kinds, the four-wheeled carrying ten cattle with a tare of 6 tons (14,560 lb.) and Bogie Cattle Vans with a capacity of twenty cattle and a tare of 23,000 lb. (12½ tons) ; also by No. 19, four-wheeled Sheep Van, carrying 250 sheep, with a tare of 31,750 lb. (14 tons 3 cwt.). These two classes of vans bring large quantities of sheep and cattle from the up-country districts to the sale-yards about 9 miles from Sydney.

No. 21. 2nd Class Carriage of Lavatory type, accommodating 70 passengers.

CLASS 503.—History and Statistics, exemplified by Exhibits of old Locomotives, Cars, Track Material, and other Relics ; Railway Law and Legislation ; Railway Technical Engineering and Mechanical Associations ; Railway Literature.

1074. COMMISSIONERS FOR NEW SOUTH WALES RAILWAYS, Sydney.

1. Two bound copies of yearly reports for 1889, 1890, 1891, and 1892, containing valuable statistical information regarding the position and progress of these Railways.
2. Samples of old Sleepers—
 - (a) Three Sleepers taken out of Suburban Line, after having been in the road for 24 years.
 - (b) Three Sleepers taken out of Western Line, near Lithgow Zig Zag, having been in the road for 23 years.

Department G.—Transportation—Railways, Vessels, Vehicles.

Group LXXXII—Class 538: Mountain Railways, &c.

GROUP LXXXII.—Miscellaneous and Special Railways.

CLASS 508.—Mountain Railways, Spirals, Switchbacks, Rack-rails, and all systems for climbing inclines; Ship Railways, Multiple Steam Railways, Moving Platforms and Side-walks, Gravity Roads, Sliding Railways, Plans, Profiles, Drawings, Photographs, and Models.

1075. COMMISSIONERS FOR NEW SOUTH WALES, Sydney.

Model of Lithgow Valley Zigzag, Blue Mountains.

The descent into the Lithgow Valley from the Mount Clarence Range—says the Engineer-in-Chief for Railways (Mr. Henry Deane)—the highest peak of the Blue Mountains traversed by the Great Western Railway, commences at 89 miles 28 chains from Sydney, where the rail-level is 3,600 feet above the level of the sea. The gradient throughout the Zigzag is 1 in 42, excepting at the reversing stations, between the points and ends of which there is a rising grade of 1 in 66.

The first descent is for 1 mile 62 chains to the end of the first reversing station, at a height of 3,362 feet, being a fall of 238 feet in 142 chains. On this incline are several cuttings and embankments, exceeding 60 feet in depth, and containing from 75,000 to 100,000 cubic yards each; also a masonry viaduct, built on a curve of 10 chains radius, consisting of five arches of 30 feet each and two of 15 feet each, or a total length of 233 feet, the highest piers being over 35 feet.

On the second descent, which is 1 mile in length, including No. 2 reversing station, at a height of 3,262 feet above the sea, there is a fall of 100 feet; and on this portion of the line there are several cuttings and embankments of over 70 feet in depth, and ranging from 20,000 to 30,000 cubic yards in each, and two masonry viaducts, viz., one of nine spans of 30 feet each, and of a total length of 330 feet, the highest piers being 75 feet (the height of these arches presenting a very fine appearance); and the other viaduct, on a curve of 10 chains radius, comprising eight 30-foot spans, of a total length of 300 feet, the highest piers being 45 feet. Also a tunnel 75 yards in length, and sideling cuttings in rock from 75 to 110 feet in depth, where 80,000 tons alone were dislodged by two shots of gunpowder.

The third and last descent of this Zigzag extends to 93 miles 30 chains, or a further length of $1\frac{1}{2}$ mile, at a height of 3,074 feet above the sea-level, or a fall of 188 feet. On this descent there are several cuttings and embankments of over 60 feet in depth, from which between 20,000 and 80,000 cubic yards of excavation were taken each. The end of the Zigzag is immediately under the first reversing station, the total fall being 527 feet in a distance of 342 chains. The length in which this descent has been gained is a little over 4 miles, although as the crow flies it is only over $1\frac{1}{2}$ mile.

This line of railway, a single track, was opened for traffic on the 18th October, 1869.

This model was prepared to the order of the Commissioners by Mr. James White of Sydney. The scale upon which it has been constructed has been 1 foot in 264 feet. The model is 20 feet long by 10 feet broad, and shows, without the reversing stations, 3 miles of railway lines, commencing at a point 90 miles from Sydney and ascending the Zigzag to the 93 miles post where the model joins the picture. All the embankments, rock-cuttings, viaducts, tunnels, &c., are faithfully modelled to scale and coloured from nature. The picture is a view of the Lithgow Valley, showing the continuation of the railway to the plains. The model is made of fibrous plaster.

Department G.—Transportation—Railways, Vessels, Vehicles.

Group LXXXIII—Classes 511, 513, and 522 : Freight Wagons, &c., and Carriage Woodwork.

GROUP LXXXIII.—Vehicles and Methods of Transportation on Common Roads.

CLASS 511.—Freight Wagons, and other Heavy Wagons for special purposes, Beer Wagons, Express Wagons, Wagons for moving heavy objects, as timbers, stone, iron, &c. Sprinkling Carts. (For Fire Engines and Ladder Trucks, see Group 70.)

1076. GOODWIN, Henry, Valentine-lane and Harris-street, Sydney.

1. Squatters' Wool Wagon, made from New South Wales timbers, viz.:—Spotted Gum, Ironbark, Blue Gum, and Beech.
2. Photograph of Works and Show-rooms.

CLASS 513.—Omnibuses, Herdies, Cabs, Hansoms, &c.

GLENCROSS, C., 6, John-street, Macdonaldtown, Sydney,

1077. A Patent Brougham Hansom Cab.

This invention, known as the "Glencross Patent," is an improved method of hanging the door of a hansom cab or other vehicle. The door is so constructed that it moves around the quarter of the cab in such a position that it does not impede the movements of the passenger on entering or leaving the vehicle; and it can be opened or closed by the driver from his seat. Not being fastened to the body of the cab, but supported by hanging links, the door does not get out of order, and will remain in any position required. The side windows are made to fall. When the doors and windows of the cab are closed, ventilators are brought into play. The cab exhibited is built of ash, with panels of colonial cedar.

1078. The Glencross Patent Cab.

The features of this private hansom cab are the extension of the roof forward so as to form a hood which covers the platform, and in providing drop-lights which unfold and open the cab. When the cab is open the lights are secreted by the hood, and the glass can be raised or let down by the driver, to form an open or closed carriage as may be required. The side windows are constructed to fall down. When the cab is closed, ventilators at the side of the vehicle are brought into use.

CLASS 522.—Wagon and Carriage Woodwork, Hardware, and Fittings.

1079. SYDNEY TRAMWAY & OMNIBUS CO. (Limited), 17, Macquarie-street, Sydney.

Set of Omnibus Wheels, as used on the streets of Sydney. The Stock are of Spotted Gum, the Spokes of Ironbark, and the Felloes of Blue Gum—all New South Wales Timbers.

Department G.—Transportation—Railways, Vessels, Vehicles.

Groups LXXXIII and LXXXV—Classes 523, 528, and 530 : Harness, &c., Vessels, &c., Docks, &c.

CLASS 523.—Harness, Saddlery, Robes, Whips, and Accessories of the Stable.

1080. HODGSON BROTHERS, Auburn-street, Goulburn.

A collection of hand-made whip-thongs and stocks, and a bridle, viz :—

1. A hide thong, for a bullock team.
2. A hide thong, for stock-riding.
3. Three stock-whips of Kangaroo hide.
4. White calf thong, for stock-riding.
5. A kangaroo thong, for a four-horse team.
6. A bridle of kangaroo-hide, plaited.

1081. McGRATH, John J., Fitzmaurice-street, Wagga Wagga.

A gentleman's improved riding saddle.

GROUP LXXXV.—Vessels, Boats, Marine, Lake, and River Transportation.

CLASS 528.—Sailing Vessels and Boats ; Sailing Vessels used in Commerce, Pilot Boats, Fishing Vessels, Sailing Yachts, Ice Boats, Ships' Boats, Pleasure Boats, Canoes and Small Boats of all kinds propelled by Sails, Oars, or Paddles ; Models, Designs, Drawings, Descriptions, Specifications, Photographs, Paintings, &c.

1082. FANNER, Robert Edmund, Willoughby-street, North Sydney.

Yacht's Gig ; to pull four or six oars, for a yacht of 40 tons ; length, 18 feet ; breadth, 4 ft. 4 in. ; depth, 1 ft. 6 in. ; built of cedar, and fitted with other woods grown in the Colony.

CLASS 530.—Vessels, Boats, and Floating Structures for Special Purposes ; Docks and other Receptacles for Vessels and Structures used for Docking or Hauling out Vessels or Boats. Transports for Carrying Railway Trains or Cars, Barges, Canal Boats ; Coal-rafts and Coal-boxes ; Water-boats, Dredges, Floating Derricks, Elevators, &c. Dry Docks and Marine Railways ; Models, Designs, Drawings, &c.

1083. COMMISSIONERS FOR NEW SOUTH WALES, Sydney.

Model of Sutherland Dock, Cockatoo Island, Sydney.

This dock, says Mr. C. W. Darley, Engineer-in-Chief for Harbours and Rivers, is entered from the western extremity of Cockatoo Island, and is the largest single graving dock that has been constructed up to the present time. It is fully provided with the best modern appliances, and is capable of receiving the largest vessel afloat.

Department G.—Transportation—Railways, Vessels, Vehicles.

Group LXXXV—Class 530 : Docks, &c.

Its principal dimensions are as follows :—

Width between copings of outer caisson berth.....	91 feet
Width between copings of outer invert	88 „
Width between copings of inner invert	84 „
Greatest width of dock between copings	108 „
Width between copings of piers	88 „
Length at cope level from inner stop to dock head	608 „
Length at cope level from outer stop to dock head	633 „
Depth from cope to sill	37 „
Water on sills at high-water spring tides	32 „
Water on sills at low-water spring tides	26 „
Floor of dock below sill of inner invert	3 ft. 6 in.
Inclination of floor	1 in 367
Batter of entrance walls	1 in 24

There are within the dock six piers, three on each side, placed opposite each other, and thus dividing the dock into four bays. Each pier is 30 feet wide at the coping, and has a flight of steps worked on its face nearest the entrance, by which a convenient descent may be made to the floor of the dock, or to any intermediate stage.

The opening and closing of the dock are effected by means of a wrought-iron caisson, which, when on the inner stop, is moved clear of the entrance by being drawn into a chamber constructed at right angles to the dock. The caisson, under these conditions, is without flotation, and travels on rollers working in chairs fixed on the floors of the inner berth and the Chamber, over which it is propelled into the mouth of the dock, or drawn clear into the chamber, by means of a small engine and suitable gearing. In connection with this contrivance, there is a safety provision, which automatically disengages and stops the engine whenever the caisson is fully placed on the dock entrance or entirely drawn into the chamber. The deck of the caisson is also by a self-acting mechanism lowered so as to pass under a wide bridge which spans the entrance to the chamber and again elevated to cope level, on the caisson being placed again on the inner stop. When, however, it is requisite to place the caisson on the outer stop, and thus secure the greatest attainable length of docking space, it is necessary to discharge the water from an air compartment, after which the caisson has sufficient buoyancy to float, and it may be warped into the outer berth, and on the rare occasions of its occupying that position it is manœuvred after the manner of an ordinary floating caisson.

In order to secure rapid handling of shores and other material used during the time vessels are being docked, two independent travelling steam jib cranes are provided, one running along each side of the dock. These cranes have friction gearing, and are silent and active in their motions. With the assistance of these machines, weights up to 2 tons can be quickly moved from the ground level to the inside of the dock, or *vice versa*. Each travelling crane is mounted on a wrought-iron tower, running on a wide-gauge railway, and penetrated by an archway through which ordinary traffic may at all times be carried on.

The main pumping machinery consists of one connected pair of horizontal surface condensing steam engines, each cylinder having a diameter of 38 inches and a stroke of 48 inches. These engines give motion to two vertical double-acting plunger pumps, each plunger having a diameter of 54 inches, and a stroke of 72 inches, and being operated by a connecting-rod engaging an arm in a crank-disc; one such disc and crank-arm being keyed on each end of the crank-shaft of the engines.

After the dock has been pumped dry, the drainage is maintained by means of a small vertical non-condensing steam engine, with a steam cylinder 14 inches in diameter, having a stroke of 12 inches, which is connected by spur gearing with a three-throw crank shaft, from which are operated three single-acting vertical pumps, each 11 inches diameter, and 30 inches stroke. This small engine also supplies the requisite power for hauling the caisson into and out of its inner berth.

Steam is supplied for all the pumping engines by three horizontal multitubular steel boilers, with shells $\frac{7}{8}$ ths of an inch thick, 6 ft. 6 in. diameter, and 15 feet long.

Each boiler has fifty-six fire-tubes, $4\frac{1}{2}$ inches diameter, extending from end to end, and is worked at a steam pressure of 80 lb. These boilers are fired externally, and underneath the front ends, and the products of combustion before entering the chimney pass through the tubes from back to front, and thence to the rear by side flues against the boiler shells. Two boilers only are required for actual work, so that a spare boiler is always free for repairs.

Department G.—Transportation—Railways, Vessels, Vehicles.

Group LXXXV—Classes 530, 534, and 536 : Docks, &c., Lighthouses, &c., Yacht and Boat Clubs.

From high-water level, spring tides, this dock, with the caisson stationed on the inner stop, contains 48,200 tons of water, and working at top speed of $20\frac{1}{2}$ turns of the engines per minute, all this can be discharged in 4 hours, but with a ship inside this time would be reduced by from 15 to 30 minutes ; in practice it is found expedient to lay a ship dry in from $5\frac{1}{2}$ to $6\frac{1}{2}$ hours.

The model of this dock was prepared to the order of the Commissioners by Mr. James White, of Sydney. The scale upon which it has been constructed is 1 foot in 40 feet. At the back of the model is shown the rock-cutting which was removed in order to level the ground, after which the dock was excavated. Within the dock is shown a model of the hull of H.M.S. "Calliope," which survived the great storm at Samoa several years ago.

1084. SMITH, Captain Charles, 14, O'Connell-street, Sydney.

Photograph of Smith's Wharf, Miller's Point, Sydney.

CLASS 534.—Protection of Life and Property and Communication at Sea ; Harbours, Lighthouses, Buoys, and similar aids to Navigation, and all pertaining thereto ; Life-saving Service, Boats, Rafts, Belts, &c. ; Precautions against Fire aboard Ship, and Devices for Extinguishing it ; Storm and Coast Signals ; Marine Signals ; Models, Plans, Samples, &c.

1085. MARINE BOARD OF NEW SOUTH WALES, Sydney.

Charts of the Coast of New South Wales, showing the positions of Lighthouses.

CLASS 536.—Miscellaneous. Trophies of Yacht and Boat Clubs ; Relics of Merchant, Marine, and River Transportation ; Relics of Arctic and other Exploration ; Seamen's Associations, Uniforms and Designations of Rank, Flags, and Ensigns of Merchant, Marine, Yacht Clubs, &c. ; Designs, Maps, Charts, Boats.

1086. MERCANTILE ROWING CLUB, Dawes' Point, Sydney.

1. Photographic view of Club's Boat-houses, Dawes' Point, Sydney.
2. Photograph of Champion Eight-oar Crew, comprising the following members, all Australian born :—W. P. Berry, E. Grace, G. Jenkins, G. McGill, W. Freeman, W. McDonald, N. McDonald, J. Thomson (stroke), and J. Blackman (coxswain) ; total weight, 90 stone.

Department G.—Transportation—Railways, Vessels, Vehicles.

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